REMARKS

Claims 18-60 were pending. Claims 26, 30, 31, 35, 39, 40, 44, 48, 49, and 60 have been amended for clarity and to address informalities. Claims 61-69 have been added. Claims 18-69 are pending.

The Office Action contains an objection to claim 60 under 37 C.F.R. § 1.75(c) on the basis of improper dependency. Claim 60 has been amended to depend correctly from claim 59. Withdrawal of the objection respectfully is requested.

1. Rejection based on Nakada et al. in view of Sin et al.:

Claims 18, 19, 21-27, 29-36, 38-43, 53, 54, and 56-60 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 6,341,053 to Nakada et al. in view of U.S. Pat. No. 6,418,048 to Sin et al. Applicant respectfully traverses this rejection.

Claim 18 recites a memory element structure with a substrate and a memory element over the substrate. The memory element comprises, *inter alia*, "a first conductor over the substrate," "a pinned magnetic structure over and electrically connected with said first conductor," "a nonmagnetic layer over said pinned magnetic structure," and "a sensing magnetic structure over said nonmagnetic layer." The sensing magnetic structure includes "an antiferromagnetic layer magnetically coupled to at least one ferromagnetic free layer applying a non-pinning magnetic bias to said at least one free layer."

Nakada et al. discloses a playback magnetic head in which a ferromagnetic free layer has a magnetic field pinned to align in a track width direction. A ferromagnetic pinned layer is aligned in the orthogonal MR height direction. The configuration disclosed by Nakada et al. demonstrates a large signal to noise ratio. See

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col. 3, lines 21-28. Nakada et al. does not teach or suggest the magnetic structure of claim 18 which includes "an antiferromagnetic layer magnetically coupled to at least one ferromagnetic free layer applying a non-pinning magnetic bias to said at least one free layer."

Sin et al. does not cure the deficiencies of Nakada et al. Sin et al. contains no teaching, suggestion, or motivation to modify the structure of Nakada et al. to provide "an antiferromagnetic layer magnetically coupled to at least one ferromagnetic free layer applying a non-pinning magnetic bias to said at least one free layer," as would be required to arrive at the present invention recited in claim 18. It is well established that references are not sufficient for *prima facie* obviousness if the proposed modification or combination would change the principle of operation of a reference. MPEP 21430.2. The signal sensing configuration disclosed by Nakada et al. aligns magnetization in the free layer along the track width direction that forms right angles to the MR height direction. The pinned free layer configuration demonstrates a large signal to noise ratio, modification of which would change to operation of the Nakada et al. reference. Claim 18 is patentable over the proposed combination of Nakada et al. and Sin et al. Claims 19-25 and 61-62 depend from claim 18 and are patentable over Nakada et al. and Sin et al. for at least the same reasons.

Claim 26 recites a memory element structure having a "pinned magnetic structure over a conductive layer," a "nonmagnetic layer over said pinned magnetic structure," and a "free magnetic structure over said nonmagnetic layer." The free magnetic structure includes "an antiferromagnetic layer over a ferromagnetic free layer." The ferromagnetic free layer has "a non-pinning magnetic bias applied thereto by the antiferromagnetic layer."

As noted above, Nakada et al. and Sin et al. do not combine to provide the MTJ structure of claim 26 in which the antiferromagnetic layer applies a non-pinning magnetic bias to free layer. Claim 26 is patentable over the proposed combination of Nakada et al. and Sin et al. Claims 27-34 and 63-64 depend from claim 26 and are patentable over Nakada et al. and Sin et al. for at least the same reasons.

Claim 35 recites a memory device including at least one magnetic random access memory element having "a pinned magnetic structure over a conductive layer," "a nonmagnetic layer over said pinned magnetic structure," and "a free magnetic structure over said nonmagnetic layer." The free magnetic structure includes "an antiferromagnetic layer over a ferromagnetic free layer." The ferromagnetic free layer has "a non-pinning magnetic bias applied thereto by the antiferromagnetic layer."

Nakada et al. and Sin et al. do not combine to provide the MTJ structure of claim 35 with an antiferromagnetic layer applying a non-pinning magnetic bias to a free layer. Claim 35 is patentable over the combination of references to Nakada et al. and Sin et al. Claims 36-43 and 65-66 depend from claim 35 and are patentable for at least the same reasons.

Claim 53 recites a magnetic memory element including "a free magnetic layer," "a pinned magnetic layer," and "a non-magnetic layer separating said free magnetic layer and said pinned magnetic layer." The free layer includes "a ferromagnetic layer and an antiferromagnetic layer" The antiferromagnetic layer supplies "a non-pinning magnetic bias to said ferromagnetic layer."

Nakada et al. discloses an antiferromagnetic layer that pins the free layer in a track width direction. See, *inter alia*, col. 4, lines 5-7. Nakada et al. does not teach or

suggest the memory element of claim 53 in which the antiferromagnetic layer supplies "a non-pinning magnetic bias to said ferromagnetic layer."

Sin et al. does not cure the deficiencies of Nakada et al. The MTJ element disclosed by Sin et al. has no antiferromagnetic layer equivalent to the non-pinning magnetic bias layer of claim 53. Claim 53 is patentable over the proposed combination of Nakada et la. and Sin et al. Claims 54-60 and 69 depend from claim 53 and are patentable for at least the same reasons.

2. Rejection based on Nakada et al. in view of Sin et al. and Perner et al.:

Claims 44, 45, and 47-52 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakada et al. in view of Sin et al. and U.S. Pat. No. 6,456,525 to Perner et al. Applicant respectfully traverses this rejection.

Claim 44 recites a processor-based system that includes an integrated circuit coupled to a processor. The integrated circuit includes "a plurality of magnetic random access memory elements." Each of the magnetic random access memory elements includes "a pinned magnetic structure over a conductive layer," "a nonmagnetic layer over said pinned magnetic structure," and "a free magnetic structure over said nonmagnetic layer." The free magnetic structure includes "an antiferromagnetic layer over a ferromagnetic free layer." The ferromagnetic free layer has "a non-pinning magnetic bias applied thereto by the antiferromagnetic layer."

As noted above in connection with claims 18 and 35, Nakada et al. and Sin et al. do not combine to render obvious a magnetic memory element in which a free magnetic structure includes an antiferromagnetic layer applying a non-pinning magnetic bias to a ferromagnetic free layer.

Perner et al. has been cited as providing a processor-based system with MRAM. Perner et al. does not obviate changing the principle of operation of Nakada et al. as would be required by its proposed with Sin et al. Claim 44 is patentable over the proposed combination of Nakada et al., Sin et al., and Perner et al. Claims 45-52 depend from claim 44 and are patentable for at least the same reasons.

3. Rejection based on Nakada et al. in view of Sin et al and further in view of Carey et al.:

Claims 20, 28, 37, and 55 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakada et al. in view of Sin et al. and further in view of U.S. Pat. No. 6,542,341 to Carey et al. Applicant respectfully traverses this rejection.

Claims 20, 28, 37, and 55 are patentable over the proposed combination of Nakada et al. and Sin et al. Carey et al. has been cited as providing a synthetic structure to the antiferromagnetic layer. Carey et al. does not avoid altering the operational principles of Nakada et al. as would be required by its proposed combination with Sin et al.

4. Rejection over Nakada et al. in view of Sin et al. and Perner et al., and further in view of Carey et al.:

Claim 46 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakada et al. in view of Sin et al. and Perner et al., and further in view of Carey et al. Applicant respectfully traverses this rejection.

Claim 46 is patentable over the proposed combination of Nakada et al., Sin et al., and Perner et al. Carey et al. has been cited as relating to synthetic antiferromagnetic structures, and does not cure the deficiencies of Nakada et al., Sin et al., and Perner et al. Claim 46 is patentable over the proposed combination of Nakada et al., Sin et al., Perner et al., and Carey et al.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

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